

WHAT IS CLAIMED IS:

1. A semiconductor device comprising a driver circuit and a pixel section comprising thin film transistors over a substrate, wherein:

a) said driver circuit includes:

a first thin film transistor comprising:

a channel forming region and a third impurity region having a conductivity type, formed on the inside of a gate electrode; and

a first impurity region having said conductivity type which forms a source region or a drain region, formed on the outside of the gate electrode; and

a fifth thin film transistor comprising:

a channel forming region, and a fifth impurity region which forms a source region or a drain region having inverse conductivity type to said conductivity type; and

b) said pixel section comprises:

a fourth thin film transistor comprising:

a channel forming region formed on the inside of a gate electrode; and

a fourth impurity region having said conductivity type, and a first impurity region having said conductivity type which forms a source region or a drain region, formed on the outside of the gate electrode.

2. A semiconductor device according to claim 1, wherein:

an impurity element having said conductivity type is included in the third impurity region and in the fourth impurity region; and

a concentration of the impurity element included in said fourth impurity region is less than a concentration of the impurity element included in said third impurity region.

3. A semiconductor device according to claim 1, wherein:

said pixel section comprises:

a light shielding film formed on said fourth thin film transistor interposing an insulating layer therebetween;

a pixel electrode connected to said fourth thin film transistor;

and

a storage capacitor comprising said light shielding film, said insulating layer contacting said light shielding film, and the pixel electrode contacting the insulating layer,

wherein said storage capacitor is connected to said fourth thin film transistor.

4. A semiconductor device according to claim 3, wherein:

said light shielding film comprises an element selected from a group consisting of aluminum, tantalum, and titanium; and

said insulating layer comprises an oxide of said element of the light shielding film.

5. A semiconductor device according to claim 3, wherein said insulating layer comprises a material selected from silicon nitride, silicon oxide, oxidized silicon nitride, diamond-like carbon (DLC), and polyimide.

6. A semiconductor device according to claim 3, wherein:

said insulating layer comprises an inorganic insulating film and an organic insulating film; and

said light shielding film is formed contacting the organic insulating film.

7. A semiconductor device according to claim 3, wherein:

said insulating layer comprises an inorganic insulating film and an organic insulating film; and

said light shielding film is formed contacting the inorganic insulating film.

8. A semiconductor device according to claim 1 wherein said semiconductor device is one selected from a group consisting of: a portable telephone, a video camera, a mobile computer, a head mount display, a projector, a portable book, a digital camera, a car navigation system, and a personal computer.

9. A semiconductor device comprising a driver circuit and a pixel section comprising thin film transistors over a substrate, wherein:

a) said driver circuit comprises:

a first thin film transistor comprising:

a channel forming region and a third impurity region having a conductivity type, formed on the inside of a gate electrode; and

a first impurity region having said conductivity type which forms a source region or a drain region, formed on the

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outside of the gate electrode;

a second thin film transistor comprising:

a channel forming region and a third impurity region having said conductivity type, formed on the inside of a gate electrode; and

a second impurity region having said conductivity type, and a first impurity region having said conductivity type which forms a source region or a drain region, formed on the outside of the gate electrode; and

a fifth thin film transistor comprising:

a channel forming region, and a fifth impurity region which forms a source region or a drain region having an inverse conductivity type to said conductivity type; and

b) said pixel section comprises:

a fourth thin film transistor having:

a channel forming region formed on the inside of a gate electrode; and

a fourth impurity region having said conductivity type, and a first impurity region which forms a source region or a drain region having said conductivity type, formed on the outside of the gate electrode.

10. A semiconductor device according to claim 2, wherein:

an impurity element having said conductivity type is included in the third impurity region and in the fourth impurity region; and

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a concentration of the impurity element included in said fourth impurity region is less than a concentration of the impurity element included in said third impurity region.

11. A semiconductor device according to claim 9, wherein:

an impurity element having said conductivity type is included in the second impurity region and in the third impurity region; and
a concentration of the impurity element included in said second impurity region is the same as a concentration of the impurity element included in said third impurity region.

12. A semiconductor device according to claim 9, wherein said pixel section further comprises:

a light shielding film formed on said fourth thin film transistor interposing an insulating layer therebetween;

a pixel electrode connected to said fourth thin film transistor;
and

a storage capacitor comprising said light shielding film, said insulating layer contacting said light shielding film, and the pixel electrode contacting the insulating layer,

wherein said storage capacitor is connected to said fourth thin film transistor.

13. A semiconductor device according to claim 12, wherein:

said light shielding film comprises an element selected from a group consisting of aluminum, tantalum, and titanium; and

said insulating layer comprises an oxide of said element of the

light shielding film.

14. A semiconductor device according to claim 12, wherein said insulating layer comprises a material selected from silicon nitride, silicon oxide, oxidized silicon nitride, diamond-like carbon (DLC), and polyimide.

15. A semiconductor device according to claim 12, wherein:

said insulating layer comprises an inorganic insulating film and an organic insulating film; and

said light shielding film is formed contacting the organic insulating film.

16. A semiconductor device according to claim 12, wherein:

said insulating layer comprises an inorganic insulating film and an organic insulating film; and

said light shielding film is formed contacting the inorganic insulating film.

17. A semiconductor device according to claim 9 wherein said semiconductor device is one selected from a group consisting of: a portable telephone, a video camera, a mobile computer, a head mount display, a projector, a portable book, a digital camera, a car navigation system, and a personal computer.

18. A semiconductor device comprising a driver circuit and a pixel section comprising thin film transistors over a substrate, wherein:

a) said driver circuit comprises:

a first thin film transistor comprising:

a channel forming region and a third impurity region having a conductivity type, formed on the inside of a gate electrode; and

a first impurity region having said conductivity type which forms a source region or a drain region, formed on the outside of the gate electrode;

a third thin film transistor comprising:

a channel forming region formed on the inside of a gate electrode; and

a second impurity region having said conductivity type, and a first impurity region having said conductivity type which forms a source region or a drain region, formed on the outside of the gate/electrode; and

a fifth thin film transistor comprising:

a channel forming region, and a fifth impurity region which forms a source region or a drain region having an inverse conductivity type to said conductivity type; and

b) said pixel section comprises:

a fourth thin film transistor comprising:

a channel forming region formed on the inside of a gate electrode; and

a fourth impurity region having said conductivity type, and a first impurity region which forms a source region or a drain region having said conductivity type, formed on the outside

of the gate electrode.

19. A semiconductor device according to claim 18, wherein:

an impurity element having said conductivity type is included in the third impurity region and in the fourth impurity region; and

a concentration of the impurity element included in said fourth impurity region is less than a concentration of the impurity element included in said third impurity region.

20. A semiconductor device according to claim 18, wherein:

an impurity element having said conductivity type is included in the second impurity region and in the third impurity region; and

a concentration of the impurity element included in said second impurity region is the same as a concentration of the impurity element included in said third impurity region.

21. A semiconductor device according to claim 18, wherein said pixel section further comprises:

a light shielding film formed on said fourth thin film transistor interposing an insulating layer therebetween;

a pixel electrode connected to said fourth thin film transistor; and

a storage capacitor comprising said light shielding film, said insulating layer contacting said light shielding film, and the pixel electrode contacting the insulating layer,

wherein said storage capacitor is connected to said fourth thin film transistor.

22. A semiconductor device according to claim 21, wherein:

said light shielding film comprises an element selected from a group consisting of aluminum, tantalum, and titanium; and

said insulating layer comprises an oxide of said element of the light shielding film.

23. A semiconductor device according to claim 21, wherein said insulating layer comprises a material selected from silicon nitride, silicon oxide, oxidized silicon nitride, diamond-like carbon (DLC), and polyimide.

24. A semiconductor device according to claim 21, wherein:

said insulating layer comprises an inorganic insulating film and an organic insulating film; and

said light shielding film is formed contacting the organic insulating film.

25. A semiconductor device according to claim 21, wherein:

said insulating layer comprises an inorganic insulating film and an organic insulating film; and

said light shielding film is formed contacting the inorganic insulating film.

26. A semiconductor device according to claim 18 wherein said semiconductor device is one selected from a group consisting of: a portable telephone, a video camera, a mobile computer, a head mount display, a projector, a portable book, a digital camera, a car navigation system, and a personal computer.

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27. A semiconductor device comprising a driver circuit and a pixel section comprising thin film transistors over a substrate, wherein:

a) said driver circuit comprises:

a first thin film transistor comprising:

a channel forming region and a third impurity region having a conductivity type, formed on the inside of a gate electrode; and

a first impurity region having said conductivity type which forms a source region or a drain region, formed on the outside of the gate electrode;

a second thin film transistor comprising:

a channel forming region and the third impurity region having said conductivity type, formed on the inside of a gate electrode; and

a second impurity region having said conductivity type, and a first impurity region which forms a source region or a drain region having said conductivity type, formed on the outside of the gate electrode;

a third thin film transistor comprising:

a channel forming region formed on the inside of a gate electrode; and

a second impurity region having said conductivity type, and a first impurity region which forms a source region or a drain region having said conductivity type, formed on the outside

of the gate electrode; and
a fifth thin film transistor comprising:

a channel forming region, and a fifth impurity region which forms
a source region or a drain region having an inverse
conductivity type to said conductivity type; and

b) said pixel section comprises:

a fourth thin film transistor comprising:

a channel forming region formed on the inside of a gate
electrode; and

a fourth impurity region having said conductivity type, and a
first impurity region which forms a source region or a drain
region having said conductivity type, formed on the outside
of the gate electrode.

28. A semiconductor device according to claim 27, wherein:

an impurity element having said conductivity type is included
in the third impurity region and in the fourth impurity region; and

a concentration of the impurity element included in said fourth
impurity region is less than a concentration of the impurity element
included in said third impurity region.

29. A semiconductor device according to claim 27, wherein:

an impurity element having said conductivity type is included
in the second impurity region and in the third impurity region; and

a concentration of the impurity element included in said second
impurity region is the same as a concentration of the impurity element

included in said third impurity region.

30. A semiconductor device according to claim 27, wherein said pixel section further comprises:

a light shielding film formed on said fourth thin film transistor interposing an insulating layer therebetween;

a pixel electrode connected to said fourth thin film transistor;
and

a storage capacitor comprising said light shielding film, said insulating layer contacting said light shielding film, and the pixel electrode contacting the insulating layer,

wherein said storage capacitor is connected to said fourth thin film transistor.

31. A semiconductor device according to claim 30, wherein:

said light shielding film comprises an element selected from a group consisting of aluminum, tantalum, and titanium; and

said insulating layer comprises an oxide of said element of the light shielding film.

32. A semiconductor device according to claim 30, wherein said insulating layer comprises a material selected from silicon nitride, silicon oxide, oxidized silicon nitride, diamond-like carbon (DLC), and polyimide.

33. A semiconductor device according to claim 30, wherein:

said insulating layer comprises an inorganic insulating film and an organic insulating film; and

said light shielding film is formed contacting the organic insulating film.

34. A semiconductor device according to claim 30, wherein:

said insulating layer comprises an inorganic insulating film and an organic insulating film; and

said light shielding film is formed contacting the inorganic insulating film.

35. A semiconductor device according to claim 27 wherein said semiconductor device is one selected from a group consisting of: a portable telephone, a video camera, a mobile computer, a head mount display, a projector, a portable book, a digital camera, a car navigation system, and a personal computer.

36. A semiconductor device having a panel comprising a pixel section and a driver circuit formed over a substrate, wherein:

a) said pixel section comprises a thin film transistor comprising:
a semiconductor layer formed over an insulating surface of said substrate;

a gate insulating film on said semiconductor layer and a gate electrode over said gate insulating film;

a channel forming region formed in said semiconductor layer;

a source region and a drain region formed in said semiconductor layer; and

a lightly doped drain (LDD) region, formed in said semiconductor layer to exclude the region underneath said gate electrode,

and

b) said driver circuit comprises:

a first thin film transistor comprising:

a first semiconductor layer formed over an insulating surface of said substrate;

a gate insulating film on said first semiconductor layer and a first gate electrode over said gate insulating film;

a first channel forming region formed in said semiconductor layer;

a first source region and a first drain region formed in said first semiconductor layer; and

a first lightly doped drain (LDD) region, formed in said first semiconductor layer provided in a portion underneath said first gate electrode, and

a second thin film transistor comprising:

a second semiconductor layer formed over an insulating surface of said substrate;

a gate insulating film on said second semiconductor layer and a second gate electrode over said gate insulating film;

a second channel forming region formed in said second semiconductor layer;

a second source region and a second drain region formed in said second semiconductor layer; and

a second lightly doped drain (LDD) region, formed in said second

semiconductor layer to exclude the region underneath said second gate electrode: and

a third thin film transistor comprising:

a third semiconductor layer formed over an insulating surface of said substrate;

a gate insulating film on said third semiconductor layer and
a third gate electrode over said gate insulating film;

a third channel forming region formed in said third semiconductor layer;

a third source region and a third drain region formed in said third semiconductor layer;

a third lightly doped drain (LDD) region formed in said third semiconductor layer provided in a portion underneath said third gate electrode, and

a fourth lightly doped drain (LDD) region, formed in said third semiconductor layer to exclude the region underneath said third gate electrode.

37. A semiconductor device according to claim 36, wherein:

an impurity element having said conductivity type is included in the third impurity region and in the fourth impurity region; and

a concentration of the impurity element included in said fourth impurity region is less than a concentration of the impurity element included in said third impurity region.

38. A semiconductor device according to claim 36, wherein:

an impurity element having said conductivity type is included in the second impurity region and in the third impurity region; and

a concentration of the impurity element included in said second impurity region is the same as a concentration of the impurity element included in said third impurity region.

39. A semiconductor device according to claim 36, wherein said pixel section further comprises:

a light shielding film formed on said fourth thin film transistor interposing an insulating layer therebetween;

a pixel electrode connected to said fourth thin film transistor;

and

a storage capacitor comprising said light shielding film, said insulating layer contacting said light shielding film, and the pixel electrode contacting the insulating layer,

wherein said storage capacitor is connected to said fourth thin film transistor.

40. A semiconductor device according to claim 39, wherein:

said light shielding film comprises an element selected from a group consisting of aluminum, tantalum, and titanium; and

said insulating layer comprises an oxide of said element of the light shielding film.

41. A semiconductor device according to claim 39, wherein said insulating layer comprises a material selected from silicon nitride, silicon oxide, oxidized silicon nitride, diamond-like carbon (DLC),

and polyimide.

42. A semiconductor device according to claim 39, wherein:

said insulating layer comprises an inorganic insulating film and an organic insulating film; and

said light shielding film is formed contacting the organic insulating film.

43. A semiconductor device according to claim 39, wherein:

said insulating layer comprises an inorganic insulating film and an organic insulating film; and

said light shielding film is formed contacting the inorganic insulating film.

44. A semiconductor device according to claim 39 wherein said semiconductor device is one selected from a group consisting of: a portable telephone, a video camera, a mobile computer, a head mount display, a projector, a portable book, a digital camera, a car navigation system, and a personal computer.

45. A method of manufacturing a semiconductor device, comprising:

a step of forming a plural number of island semiconductor layers over a substrate having an insulating surface;

a step of forming a gate insulating layer contacting said island semiconductor layers;

a step of forming gate electrodes contacting said gate insulating layer;

a step of forming a first thin film transistor having a first

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impurity region, and a third impurity region which overlaps said gate electrode, by doping an impurity element with one conductivity type into selected regions of said island shape semiconductor layers;

a step of forming a fifth thin film transistor having a fifth impurity region, by doping an impurity element with inverse conductivity type into selected regions of said island shape semiconductor layers; and

a step of forming a fourth thin film transistor having a first impurity region and a fourth impurity region, by doping an impurity element with one conductivity type into selected regions of said island shape semiconductor layers.

46. A method of manufacturing a semiconductor device according to claim 45, wherein:

the same impurity element with one conductivity type is doped into said third impurity region and into said fourth impurity region; and

a concentration of the impurity element included in said fourth impurity region is doped to less than said concentration of the impurity element included in said third impurity region.

47. A method of manufacturing a semiconductor device according to claim 45, wherein:

the same impurity element with one conductivity type is doped into said second impurity region and into said third impurity region; and

a concentration of the impurity element included in said second

insulating layer.

52. A method of manufacturing a semiconductor device according to claim 48, wherein:

said insulating layer is formed from an inorganic insulating layer and an organic insulating layer; and

said light shielding film is formed contacting the inorganic insulating layer.

53. A method of manufacturing a semiconductor device according to claim 45, wherein said semiconductor device is an electronic device selected from a group consisting of portable telephone, a video camera, a mobile computer, a head mount display, a projector, a portable book, a digital camera, a car navigation system, and a personal computer.

54. A method of manufacturing a semiconductor device, comprising:

a step of forming a plural number of island semiconductor layers over a substrate having an insulating surface;

a step of forming a gate insulating layer contacting said island semiconductor layers;

a step of forming gate electrodes contacting said gate insulating layer;

a step of forming a first thin film transistor having a first impurity region, and a third impurity region which overlaps said gate electrode, by doping an impurity element with one conductivity type into selected regions of said island shape semiconductor layers;

a step of forming a second thin film transistor having a first

impurity region, a third impurity region which overlaps said gate electrode, and a second impurity region which does not overlap said gate electrode, by doping an impurity element with one conductivity type into selected regions of said island shape semiconductor layers;

a step of forming a fifth thin film transistor having a fifth impurity region, by doping an impurity element with inverse conductivity type into selected regions of said island shape semiconductor layers; and

a step of forming a fourth thin film transistor having a first impurity region and a fourth impurity region, by doping an impurity element with one conductivity type into selected regions of said island shape semiconductor layers.

55. A method of manufacturing a semiconductor device according to claim 54, wherein:

the same impurity element with one conductivity type is doped into said third impurity region and into said fourth impurity region; and

a concentration of the impurity element included in said fourth impurity region is doped to less than said concentration of the impurity element included in said third impurity region.

56. A method of manufacturing a semiconductor device according to claim 54, wherein:

the same impurity element with one conductivity type is doped into said second impurity region and into said third impurity region; and

said light shielding film is formed contacting the organic insulating layer.

61. A method of manufacturing a semiconductor device according to claim 57, wherein:

said insulating layer is formed from an inorganic insulating layer and an organic insulating layer; and

said light shielding film is formed contacting the inorganic insulating layer.

62. A method of manufacturing a semiconductor device according to claim 54, wherein said semiconductor device is an electronic device selected from a group consisting of portable telephone, a video camera, a mobile computer, a head mount display, a projector, a portable book, a digital camera, a car navigation system, and a personal computer.

63. A method of manufacturing a semiconductor device, comprising:

a step of forming a plural number of island semiconductor layers over a substrate having an insulating surface;

a step of forming gate insulating films contacting said island semiconductor layers;

a step of forming gate electrodes contacting said gate insulating films;

a step of forming a first thin film transistor having a first impurity region, and a third impurity region which overlaps said gate electrodes, by doping an impurity element with one conductivity type into selected regions of said island shape semiconductor layers;

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a step of forming a third thin film transistor having a first impurity region, and a second impurity region which does not overlap said gate electrode, by doping an impurity element with one type conductivity into selected regions of said island shape semiconductor layers;

a step of forming a fifth thin film transistor having a fifth impurity region, by doping an impurity element with inverse conductivity type into selected regions of said island shape semiconductor layers; and

a step of forming a fourth thin film transistor having a first impurity region and a fourth impurity region, by doping an impurity element with one conductivity type into selected regions of said island shape semiconductor layers.

64. A method of manufacturing a semiconductor device according to claim 63, wherein:

the same impurity element with one conductivity type is doped into said third impurity region and into said fourth impurity region; and

a concentration of the impurity element included in said fourth impurity region is doped to less than said concentration of the impurity element included in said third impurity region.

65. A method of manufacturing a semiconductor device according to claim 63, wherein:

the same impurity element with one conductivity type is doped into said second impurity region and into said third impurity region;

and

a concentration of the impurity element included in said second impurity region is doped to the same as said concentration of the impurity element included in said third impurity region.

66. A method of manufacturing a semiconductor device according to claim 63, wherein:

a storage capacitor is formed by:

a step of forming an insulating layer on said fourth thin film transistor;

a step of forming a light shielding film on said insulating layer;

a step of forming a dielectric film contacting said light shielding film; and

a step of forming a conductive film contacting said dielectric film.

67. A method of manufacturing a semiconductor device according to claim 66, wherein said step of forming the dielectric film contacting the light shielding film is an anodic oxidation process.

68. A method of manufacturing a semiconductor device according to claim 66, wherein said light shielding film is formed from a material selected from a group consisting of aluminum, tantalum, and titanium.

69. A method of manufacturing a semiconductor device according to claim 66, wherein:

said insulating layer is formed from an inorganic insulating

layer and an organic insulating layer; and

said light shielding film is formed contacting the organic insulating layer.

70. A method of manufacturing a semiconductor device according to claim 66, wherein:

said insulating layer is formed from an inorganic insulating layer and an organic insulating layer; and

said light shielding film is formed contacting the inorganic insulating layer.

71. A method of manufacturing a semiconductor device according to claim 63, wherein said semiconductor device is an electronic device selected from a group consisting of portable telephone, a video camera, a mobile computer, a head mount display, a projector, a portable book, a digital camera, a car navigation system, and a personal computer.

72. A method of manufacturing a semiconductor device, comprising:

a step of forming a plural number of island shape semiconductor layers on a substrate having an insulating surface;

a step of forming gate insulating films contacting said island shape semiconductor layers;

a step of forming gate electrodes contacting said gate insulating films;

a step of forming a first thin film transistor having a first impurity region, and a third impurity region which overlaps said gate electrodes, by doping an impurity element with one conductivity type

into selected regions of said island shape semiconductor layers;

a step of forming a second thin film transistor having a first impurity region, a third impurity region which overlaps said gate electrode, and a second impurity region which does not overlap said gate electrode, by doping an impurity element with one conductivity type into selected regions of said island shape semiconductor layers;

a step of forming a third thin film transistor having a first impurity region, and a second impurity region which does not overlap said gate electrode, by doping an impurity element with one conductivity type into selected regions of said island shape semiconductor layers;

a step of forming a fifth thin film transistor having a fifth impurity region, by doping an impurity element with inverse conductivity type into selected regions of said island shape semiconductor layers;
and

a step of forming a fourth thin film transistor having a first impurity region and a fourth impurity region, by doping an impurity element with one conductivity type into selected regions of said island shape semiconductor layers.

73. A method of manufacturing a semiconductor device according to claim 72, wherein:

the same impurity element with one conductivity type is doped into said third impurity region and into said fourth impurity region;
and

a concentration of the impurity element included in said fourth impurity region is doped to less than said concentration of the impurity

element included in said third impurity region.

74. A method of manufacturing a semiconductor device according to claim 72, wherein:

the same impurity element with one conductivity type is doped into said second impurity region and into said third impurity region; and

a concentration of the impurity element included in said second impurity region is doped to the same as said concentration of the impurity element included in said third impurity region.

75. A method of manufacturing a semiconductor device according to claim 72, wherein:

a storage capacitor is formed by:

a step of forming an insulating layer on said fourth thin film transistor;

a step of forming a light shielding film on said insulating layer;

a step of forming a dielectric film contacting said light shielding film; and

a step of forming a conductive film contacting said dielectric film.

76. A method of manufacturing a semiconductor device according to claim 75 wherein said step of forming the dielectric film contacting the light shielding film is an anodic oxidation process.

77. A method of manufacturing a semiconductor device according to claim

75, wherein said light shielding film is formed from a material selected from a group consisting of aluminum, tantalum, and titanium.

78. A method of manufacturing a semiconductor device according to claim 75, wherein:

said insulating layer is formed from an inorganic insulating layer and an organic insulating layer; and

said light shielding film is formed contacting the organic insulating layer.

79. A method of manufacturing a semiconductor device according to claim 75, wherein:

said insulating layer is formed from an inorganic insulating layer and an organic insulating layer; and

said light shielding film is formed contacting the inorganic insulating layer.

80. A method of manufacturing a semiconductor device according to claim 72, wherein said semiconductor device is an electronic device selected

from a group consisting of portable telephone, a video camera, a mobile computer, a head mount display, a projector, a portable book, a digital camera, a car navigation system, and a personal computer.

81. A semiconductor device according to claim 1 wherein said semiconductor device comprises an electro-luminescence display panel.

82. A semiconductor device according to claim 9 wherein said semiconductor device comprises an electro-luminescence display panel.

83. A semiconductor device according to claim 18 wherein said

semiconductor device comprises an electro-luminescence display panel.

84. A semiconductor device according to claim 27 wherein said semiconductor device comprises an electro-luminescence display panel.

85. A semiconductor device according to claim 36 wherein said semiconductor device comprises an electro-luminescence display panel.

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